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ABSTRACT

The expert-novice paradigm, which demonstrates the outstanding role of domain-specific knowledge in explaining differences in memory behavior and performance, was examined. Two studies are described which compared memory performance of groups equivalent with regard to domain-specific knowledge but differing in intellectual ability. The hypothesis was that comparing good and poor learners with equivalent domain-specific knowledge should provide the base for evaluating the importance of access--the spontaneous and strategic use of potentially available information in order to understand and learn. Both studies dealt with West German third-, fifth-, and seventh-grade soccer experts' and novices' memory and comprehension of a story dealing with a soccer game. Several measures of memory performance, memory monitoring, and text comprehension were used. As a main result of both studies, no significant differences between good learner and poor learner experts were detected, regardless of age. Furthermore, poor learner experts outperformed good learners novices in all memory and comprehension measures. All in all, the findings of the two studies supported the conclusion that the contents of the knowledge base and not access in the sense of strategic use of information determined the extent to which text information is memorized and understood. (Author/GDC)

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The Knowledge Base and Memory Performance:
A Comparison of Academically Successful and
Unsuccessful Learners

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Abstract

Recent research using the expert-novice paradigm has convincingly demonstrated the outstanding role of domain-specific knowledge in explaining differences in memory behavior and performance. In this paper, two studies are described that compared memory performance of groups equivalent with regard to domain-specific knowledge but differing in aspects of intellectual ability. The hypothesis was that comparing good and poor learners with equivalent domain-specific knowledge should provide the base for evaluating the importance of access, that is, the spontaneous and strategic use of potentially available information in order to understand and learn. Both studies dealt with third-, fifth-, and seventh grader soccer experts' and novices' memory and comprehension of a story dealing with a soccer game. Several measures of memory performance, memory monitoring, and text comprehension were used. As a main result of both studies, no significant differences between good learner and poor learner experts were detected, regardless of age. Furthermore, poor learner experts outperformed good learners novices in all memory and comprehension measures. All in all, the findings of the two studies support the conclusion that the contents of the knowledge base and not access in the sense of strategic use of information determines the extent to which text information is memorized and understood.

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The knowledge base and memory performance: A comparison of academically successful and unsuccessful learners.

It is an everyday observation that people who know more about an area than others find it easier to remember new information linked to that specific area. The fact that older children typically recall more than younger ones may in large part be due to the older children knowing more about the kind of material they are trying to remember. Given that the contents and structure of the knowledge system change markedly with age, it is particularly important to examine developmentally the relationship between knowledge and memory.

Since the late seventies, a growing body of research has examined the effects of the knowledge base on memory strategies and performance in various memory tasks. As a main result, these studies showed that children's prior knowledge substantially affected their choice of memory strategies and significantly influenced memory performance (cf. Bjorklund, 1985; Chi, 1985, Körkel, 1987; Ornstein & Naus, 1985; Schneider & Weinert, 1987 for reviews).

The most impressive evidence stems from studies contrasting the performance of experts and novices in a specific domain. For example, Chi (1978) provided evidence for how greatly the knowledge base can influence children's memory performance. Chi compared memory for chess positions in chess experts and novices. A critical manipulation was the knowledge variable, in that the novices were adults and the experts were children averaging 10 years of age. The major finding was that the young experts outperformed the novices on a chess reproduction task, both in terms of actual memory performance, and in predicting in advance how well they would perform. As a control, to demonstrate that these

effects were actually mediated by the knowledge base and not by intelligence or related variables, a digit span memory task was also given. Not surprisingly, the results of this memory task were the reverse of the chess reproduction task. Thus it seemed safe to conclude that differences in the knowledge base can outweigh all other memory differences between children and adults and can lead to dramatic reversals of age-related improvements in cognitive performance.

While this and other studies into the expert-novice paradigm (e.g. Chiesi, Spilich, & Voss, 1979; Spilich, Vesonder, Chiesi, & Voss, 1979) have confirmed the outstanding role of domain-specific knowledge in explaining patterns of recall, they did not contribute much to our understanding of how experts are able to use their better structural knowledge in the service of remembering (cf. Ornstein & Naus, 1985). The major problem here is that it is difficult to infer something about the representation of knowledge on the basis of performance on memory tasks. At least two different possible features of knowledge might influence performance on memory tasks: (1) The contents of the knowledge base, and (2) the ease with which information is retrieved from the knowledge system (cf. Brown, Bransford, Ferrara, & Campione, 1983; Ornstein & Naus, 1985). Typical conceptualizations of the knowledge base refer to associative networks which become more complex and dense with age. Because the addition of interrelations in the knowledge system may shorten the retrieval process, it is difficult to examine the contents of the knowledge base without considering questions of access: The superior performance of experts can be interpreted in terms of their particularly rich content knowledge, or in terms of a faster, more efficient process of gaining access to the relevant information, or both.

In our view, one possible way to differentiate between the effects of the contents of the memory system and the ease of access is to compare memory

performance of groups that possess the content knowledge necessary for successful memory performance, but differ in aspects of intellectual ability. More precisely, the assumption is that comparing good and poor learners with equivalent domain-specific knowledge provides the base for evaluating the importance of the access variable. Accordingly, the influence of access, that is, the spontaneous and strategic use of potentially available information in order to understand and learn, could be inferred in case of significant performance differences between good and poor learners, whereas this factor would appear to be negligible if comparable memory performance across groups is found (cf. Brown et al., 1983). In the latter case, results could be explained by a generally powerful automatic effect of domain-specific knowledge on encoding and retrieval processes that compensates for individual differences in strategic processing.

The few empirical studies tapping this problem yielded conflicting evidence. Bransford, Stein, Shelton, and Owings (1981) compared the performances of academically successful and unsuccessful fifth graders who were asked to learn a passage about robots. The successful learners were clearly superior in activating pre-existing knowledge in drawing inferences and in asking themselves relevant questions about the information they were trying to learn. The less successful students had the potential to do so, but did not do this spontaneously. On the other hand, Marr and Gormley (1982) analyzed the relationship between comprehension ability and prior knowledge in fourth-graders' recall of structurally equivalent texts, and found no effects of ability. Instead, prior knowledge turned out to be the only powerful predictor of memory and comprehension performance.

Given this conflicting evidence, we decided to reanalyze some of our data

that seem suited to consider this problem in more detail. These data stem from two studies conducted within a large-scale research project (Körkel, 1987; Weinert, Knopf, Körkel, Schneider, Vogel, & Wetzels, 1984). In both studies, the expert-novice paradigm was used to assess the impact of content knowledge on text comprehension and recall. In particular, both studies were comparable in that they investigated the influence of knowledge about soccer on comprehension and recall of a story about a soccer game. Third-, fifth-, and seventh graders served as subjects in both studies. At each age level, approximately half of the subjects were classified as soccer experts and half as novices according to their performance on a questionnaire that tapped knowledge of soccer rules and important soccer events. The two studies differed, however, with regard to the dependent variables used. While memory for text details, the ability to draw inferences, and the ability to detect contradictions in the text were the major outcome measures in Study 1 (Weinert et al., 1984), various measures of memory, strategy use, and metamemory were additionally available in Study 2 (Körkel, 1987). As several indicators of intellectual ability (e.g., IQ measures) and learning success (e.g., grades) were available in both studies, it was possible to further subdivide the samples of soccer experts and novices into subgroups of good and poor learners.

Study 1

A total of 576 middle-class children (106 third-, 236 fifth-, and 234 seventh graders from rural and urban schools in the Heidelberg area participated in the study. An equal number of boys and girls was included at each age level. All testing was done in group sessions.

A sixteen-item questionnaire was used to assess children's knowledge about soccer. Thirteen multiple-choice items tapped subjects' knowledge about soccer rules, whereas the remaining three items assessed knowledge about important soccer events. Each item on the questionnaire was given a score of 1 or 0 (maximum score of 16). Children with scores ranging between 10 and 16 were classified as soccer experts, and those with scores below 10 were considered soccer novices. To identify good and poor learners within the groups of soccer experts and novices, children's grades in math and German as well as their scores on a verbal and nonverbal intelligence test (a German cognitive ability test and the Culture-Fair Intelligence test) were considered.

At each grade level, those subjects with above-average IQ scores and above-average grades in math and German were classified as academically successful learners, whereas those children scoring low in both intelligence tests and with grades below average were classified as academically unsuccessful learners. As a consequence, four groups were differentiated at each grade level: soccer experts/good learners; soccer experts/poor learners; soccer novices/good learners, and soccer novices/poor learners.

All subjects were presented with a narrative text dealing with a soccer game. The story was about a young soccer player's experiences in an important match. After a short description of the young hero and his activities before the game, the course of action during the game was described in detail. The story ended with a description of the hero's physical and psychological condition after the game was over.

Precautions were taken to ensure that most parts of the story were easily understandable for novices. Amstad's (1978) version of the Flesch formula was used to assess text readability. This formula yields values ranging from 0 (low

readability) to 100 (high readability). The average score obtained for our story ($\bar{x}$ = 80) indicated that the text was easily readable for the different age groups under study. In addition, a structural analysis of the text based on the grammar of Mandler and Johnson (1977; Johnson & Mandler, 1980) revealed that the story could be considered as simple and well-structured according to the criteria of these authors.

However, there were a few exceptions to this rule. Occasionally, sentences were shortened; that is, important information was omitted that had to be inferred by the reader. Moreover, several contradictions were built into the text that could only be detected by careful reading. For example, the hero was first described as a fast soccer player, but later referred to as very slow and sluggish. While prior knowledge about soccer was important in order to draw correct inferences, it was not at all necessary to detect the contradictions in the text.

The story was taped and presented twice to the subjects. While listening to the story, they also had opportunity to simultaneously read a written version in front of them. About 15 minutes later, subjects were given a ten-item questionnaire that tapped children's memory for text details, their detection of contradictions in the text, and their ability to draw correct inferences. Each item on the questionnaire was given a score of 1 or 0; a maximum score of 4 was possible for the memory variable, and a maximum score of 3 resulted for the text comprehension variables.

Previous analyses had yielded significant effects of grade and the knowledge base on these three dependent variables: older children and soccer experts remembered more text details, drew more correct inferences, and detected more contradictions in the text (cf. Weinert et al., 1984). No significant

interactions were found in these analyses. The major question of interest in this secondary analysis of the data was whether the subdivision of experts and novices into good and poor learners described above would lead to a different pattern of results.

Table 1 contains the means and standard deviations for all three variables as a function of grade, expertise, and learning success. These data were analyzed in three Grade (3) x Expertise (4) factorial analyses of variance with Memory for Text Details, Correct Inferences, and Detection of Contradictions as dependent variables.

Insert Table 1 about here

With regard to Memory for Text Details, significant main effects were found for Grade, $F(2,391) = 17.00$, $p < .01$, and Expertise, $F(3,391) = 12.32$, $p < .01$. No significant interaction was found. Post-hoc comparisons (Student-Newman-Keuls tests) revealed that on the average, fifth and seventh graders remembered more than third graders but did not differ from each other. Moreover, it was found that, with the exception of third graders, the expert/poor learner group outperformed all other groups, and the expert/good learner group was better than the two novice groups, which showed comparable memory performance.

With regard to the Correct Inferences variable, significant main effects were found for Grade, $F(2,391) = 41.11$, $p < .01$, and Expertise, $F(3,391) = 36.69$, $p < .01$. Again, no significant interaction was found. Subsequent Student-Newman-Keuls tests revealed that seventh graders drew more correct inferences than fifth graders, who in turn were better than third graders. The two expert groups did not differ from each other but were significantly better than the two

novice groups who showed equivalent performance.

In the ANOVA on Detection of Contradictions, significant effects were found for Grade, $F(2,391) = 52.48$, $p < .01$, and Expertise, $F(3,391) = 26.74$, $p < .01$. Further, the Grade x Expertise interaction was significant, $F(6,391) = 5.33$, $p < .01$. Posthoc analyses revealed that seventh graders detected more contradictions than fifth graders, which in turn were better than third graders. Again, the two expert groups did not differ from each other but were better than the two novice groups, who showed comparable performance. This finding, however, was qualified by the Grade x Expertise interaction: Whereas the Expert/Good Learner group outperformed the Expert/Poor Learner group in fifth grade, the opposite was true for seventh graders.

All in all, these findings indicate that performance on the three dependent variables was generally dependent on the children's knowledge base, regardless of age. That is, in all age groups, soccer experts recalled more text details, drew more correct inferences, and on the average detected more contradictions in the text than did soccer novices. Interestingly, the distinction between soccer experts and novices of different academic levels did not change this general pattern of findings. For all three dependent measures, the poor learner experts scored significantly higher than those novices characterized as academically successful. The fact that good and poor learner experts performed almost equally on all three dependent variables sheds doubt on the assumption that academically successful and unsuccessful learners have different access to their knowledge systems.

It should be noted, however, that the empirical evidence was restricted in that the dependent variables measuring text recall and comprehension consisted of only a few items. Thus, the conclusions drawn from Study 1 need to be

validated by a closer and more comprehensive analysis of memory and comprehension processes of soccer experts and novices with different academic histories. Study 2 (Körkel, 1987) was designed to serve these purposes.

Study 2

The subjects were 185 middle-class children (64 third graders, 67 fifth graders, 54 seventh graders). Children were selected from two public schools located near Heidelberg, West Germany. An equal number of boys and girls was included at each age level.

Several variables assessed in Study 1 were also available in Study 2. For example, identical measures of verbal and nonverbal intelligence and of academic success, the same questionnaire assessing knowledge about soccer and the same story about a soccer game were used in both studies. As a consequence, the classification of soccer experts and novices with different academic histories in Study 2 followed the principles of the classification reported for Study 1.

As already noted, the major advantage of Study 2 concerned the selection of dependent measures. Three different memory performance variables were assessed: First, subjects freely recalled the soccer story. The instruction was that the children should do their best to recall the story as accurately and comprehensively as possible. The recall protocols were analyzed according to the procedure developed by Mandler and Johnson, that is, in terms of "semantic" or idea units. At maximum, 36 different idea units could be reproduced.

A cloze test was used as a second measure of (supported) recall. All subjects were presented with a written version of the story that included 20

blanks, and were asked to fill the gaps as accurately as possible. One point was given for each correct completion of the text (maximum score of 20).

Finally, a recognition test was given. The whole test consisted of 24 sentences. In addition to 11 "old", that is, original sentences, 13 "new" distractor sentences were included. Precautions were taken to ensure that the distractor sentences referred to the course of action described in the soccer story, and that they were difficult to identify, that is, similar to "old" sentences not included in the recognition test. One point was given for each correct identification of an original sentence and for each correct rejection of a distractor sentence (maximum score of 24).

In addition to the three performance measures, several indicators of strategic operations and metacognitive processes were available in this study. These indicators included subjects' importance ratings of the text, their feeling-of-knowing judgements when completing the cloze test, their performance prediction for the free recall task, and their declarative knowledge about text recall.

The importance rating procedure is a very popular tool in the area of text memory and comprehension (cf. Brown et al., 1983, for a review). The version used in this study required the children to select and underline those ten sentences in the soccer text that they conceived of as the most important and necessary for an efficient reproduction of the text. Children's importance ratings were then compared with an "ideal" importance rating of the text based on the judgments of 20 adult soccer experts (students and faculty members of different departments at the University of Heidelberg). One point was given when a sentence judged as important corresponded with an "objectively" important sentence selected by the adult

experts (maximum score of 10).

Immediately after the importance rating procedure, subjects were asked to predict the number of sentences they could freely recall if asked to do so. Prediction accuracy was assessed by relating performance prediction and actual performance in the free recall task. More precisely, it was defined as the absolute value of the difference between the recall estimate and actual recall, divided by recall. According to this formula, smaller scores correspond with better prediction accuracy.

With regard to the feeling-of-knowing judgments, the relevant information was taken from the cloze test. When completing the blanks in the cloze test, subjects were asked to indicate whether the completion of the text was correct or incorrect in their opinion. Correct evaluations, that is, hits (i. e., both completion and evaluation correct) and correct rejections (i. e., completion incorrect and evaluation correct) were summed up, yielding a maximum score of 20.

Finally, children's verbalizable knowledge (metamemory) about text processing and recall was assessed by using a 17-item questionnaire modeled after the interviews developed by Kreutzer, Leonard, and Flavell (1975) and Myers and Paris (1978). One point was given for each item, thus yielding a maximum score of 17.

Preliminary analyses revealed that there were no significant expert/novice differences for two measures, namely the recognition test and the declarative metamemory interview. Not surprisingly, subdividing experts and novices according to learning skill did not change the pattern of results. As a consequence, the findings for those two measures will not be discussed in detail here.

Table 2 contains the means and standard deviations for the remaining two memory variables as a function of grade, expertise, and learning success. These data were analyzed in two Grade (3) x Expertise (4) factorial analyses of variance with Free Recall and Supported Recall (maze test) as dependent variables.

Insert Table 2 about here

With regard to Free Recall, significant main effects were found for Grade, $F(2,151) = 20.58$, $p < .01$, and Expertise, $F(3,151) = 25.19$, $p < .01$. Subsequent Student-Newman-Keuls tests revealed that seventh graders recalled more than fifth graders, who in turn were better than third graders. The two expert groups did not differ from each other but were significantly better than the two novice groups, who showed equivalent performance.

The findings for Supported Recall were different in that no main effect for Grade was found. The main effect of Expertise was significant, $F(3,151) = 13.82$, $p < .01$. Again, the two expert groups did not differ from each other but were better than the two novice groups, who showed comparable performance.

Taken together, the findings for the two memory performance variables parallel those obtained for the memory performance variable in Study 1. There were pronounced differences between experts and novices, and the distinction between different learning skill level did not change this general pattern of results. The good- and poor-learner experts performed almost equally on the two dependent variables, and there were also no differences in good- and poor-learner novices' memory performances.

Although these findings seem to indicate that children with different

learning skills have similar access to their knowledge system, a more conclusive answer to this question can be obtained by directly analyzing children's text-related strategies and metacognitive processes (i. e. memory monitoring) while memorizing and comprehending the text information. The three variables to be considered in this context are the quality of subjects' importance ratings, their feeling-of-knowing judgments concerning the appropriateness of their text completions on the cloze test, and their estimates or predictions of free recall.

Table 3 contains the means and standard deviations for these three variables as a function of grade, expertise, and learning success. These data were analyzed in three Grade (3) x Expertise (4) factorial analyses of variance with Importance Rating, Feeling-of-Knowing, and Prediction Accuracy as the dependent variables.

Insert Table 3 about here

With regard to Importance Rating, significant effects were found for Grade, $F(2,151) = 5.89$, $p < .01$, and Expertise, $F(3,151) = 17.80$, $p < .01$. Seventh graders selected more important sentences than third graders but did not outperform fifth graders, who in turn were not superior to third graders. The pattern of results for Expertise resembled those found for the memory performance variables: The two expert groups did not differ from each other, but were significantly better than the two novice groups, who showed equivalent performance.

The latter finding was also true for the two memory monitoring variables. The F 's (3,151) concerning the effects of the Expertise factor for the Feeling-

of-Knowing and Prediction Accuracy variables were 7.87 and 9.43, respectively (all p 's < .01). Interestingly, no significant Grade effects were found for these two variables.

In sum, the findings obtained for text-related strategic and metacognitive processes supported the assumption that children familiar with the contents of the text outperform novices on these variables. However, the almost equivalent results obtained for experts with different learning skills sheds doubt on the assumption that access to the knowledge base is different in academically successful and unsuccessful learners.

Conclusions

The two studies summarized in this paper assessed the role of the knowledge base in influencing various aspects of text comprehension and recall. In Study 1, soccer experts and novices were compared on their ability to memorize text details, to draw inferences, and to detect contradictions in the text. Not surprisingly, experts outperformed novices on all three outcome measure. More interestingly, the distinction between soccer experts and novices of different academic levels did not change this pattern of findings. That is, good- and poor-learner experts did not differ from each other.

This somewhat unexpected finding was validated by the results of Study 2. Here, it was shown that the knowledge base affected (unassisted and supported) text recall, whereas recognition performance was comparable for experts and novices. As in Study 1, groups of good and poor learner experts did not differ from each other but were clearly superior to the two novice groups. A similar pattern of results was found for the strategy and memory monitoring variables

assessed in Study 2, thus demonstrating that experts with different learning skills were comparable in their strategic processes and memory monitoring skills.

On the other hand, general declarative metamemory did not differ for the four experimental groups, and its impact on text recall and comprehension was negligible compared to that of the memory monitoring variables.

By and large, then, the findings of the two studies support the conclusion that children's prior knowledge about text contents is a much more powerful predictor of their text comprehension and recall than their general intellectual ability or learning skills. The results thus confirm the findings by Marr and Gormley (1982) that subjects' prior knowledge and not their general comprehension ability was a crucial factor in explaining performance. It appears, then, that the contents of the knowledge base determines the ease with which information is retrieved from the memory system, and that the influence of access, that is, the strategic use of potentially available information in order to understand and learn is less important.

However, we would still hesitate to generalize these findings. It should be noted that our soccer story was well-structured in most parts and easily readable even for third graders. The discrepancy between our results and those obtained by Bransford et al. (1981) could at least partly be due to the fact that their robot story was more difficult to understand and required the ability to draw more complex inferences than was necessary for the children in our studies. As task difficulty may be a crucial factor, the sample of criterion measures (i.e., texts) clearly needs to be expanded to evaluate its importance for the issue discussed in this paper.

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Table 1: Means and standard deviations (in parentheses) for
the three dependent variables of Study 1 as a
function of grade, expertise, and academic success

	Variables		
	Text Details	Inferences	Contradictions
Grade 3			
Experts			
Good Learners	2.33 (0.72)	1.58 (0.97)	0.22 (0.41)
Poor Learners	2.38 (0.87)	1.67 (0.98)	0.25 (0.50)
Novices			
Good Learners	2.02 (0.73)	0.60 (0.67)	0.05 (0.22)
Poor Learners	1.92 (0.76)	0.84 (0.55)	0.08 (0.28)
Grade 5			
Experts			
Good Learners	2.77 (0.59)	2.27 (0.74)	1.35 (0.75)
Poor Learners	3.02 (0.75)	2.39 (0.79)	0.82 (0.69)
Novices			
Good Learners	2.18 (0.69)	1.28 (0.72)	0.56 (0.61)
Poor Learners	2.13 (0.94)	1.30 (0.90)	0.31 (0.46)
Grade 7			
Experts			
Good Learners	2.75 (0.67)	2.55 (0.75)	1.10 (0.79)
Poor Learners	2.97 (0.66)	2.35 (0.70)	1.48 (0.81)
Novices			
Good Learners	2.40 (0.72)	1.90 (0.92)	0.73 (0.60)
Poor Learners	2.38 (0.77)	1.67 (1.00)	0.75 (0.75)

Table 2: Means and standard deviations (in parentheses) for the text recall variables of Study 2 as a function of grade, expertise, and academic success

Grade 3				
Variables	Experts		Novices	
	Good Learners	Poor Learners	Good Learners	Poor Learners
Free Recall	13.42 (3.71)	13.50 (2.70)	9.56 (3.75)	8.00 (2.73)
Supported Recall	17.68 (1.49)	17.00 (1.41)	14.56 (1.92)	13.57 (1.99)
Grade 5				
Variables	Experts		Novices	
	Good Learners	Poor Learners	Good Learners	Poor Learners
Free Recall	16.50 (2.67)	17.30 (2.83)	11.00 (3.07)	10.72 (3.04)
Supported Recall	16.90 (2.55)	16.92 (1.03)	14.50 (1.70)	14.76 (2.22)
Grade 7				
Variables	Experts		Novices	
	Good Learners	Poor Learners	Good Learners	Poor Learners
Free Recall	21.33 (0.57)	20.08 (1.91)	14.52 (4.88)	13.38 (4.50)
Supported Recall	17.33 (1.52)	17.50 (1.44)	16.39 (2.16)	16.18 (2.61)

Table 3: Means and standard deviations (in parentheses) for the strategy use and memory monitoring variables of Study 2 as a function of grade, expertise, and academic success

		I m p o r t a n c e		V a r i a b l e s		P e r f o r m a n c e	
		R a t i n g		F e e l i n g - o f -		P r e d i c t i o n	
				K n o w i n g			
G r a d e 3							
Experts							
Good Learners	5.35	(2.12)	16.21	(3.21)	0.21	(0.19)	
Poor Learners	4.66	(1.17)	16.00	(2.41)	0.18	(0.06)	
Novices							
Good Learners	3.04	(1.56)	13.00	(3.89)	0.41	(0.21)	
Poor Learners	2.14	(1.58)	12.00	(2.38)	0.76	(0.63)	
G r a d e 5							
Experts							
Good Learners	5.00	(1.15)	16.30	(1.82)	0.27	(0.21)	
Poor Learners	5.54	(1.95)	16.69	(1.88)	0.36	(0.23)	
Novices							
Good Learners	3.50	(2.12)	14.50	(2.12)	0.48	(0.08)	
Poor Learners	3.61	(0.96)	14.80	(2.53)	0.55	(0.21)	
G r a d e 7							
Experts							
Good Learners	5.66	(0.57)	16.00	(1.02)	0.15	(0.15)	
Poor Learners	6.00	(1.53)	16.00	(2.48)	0.24	(0.19)	
Novices							
Good Learners	4.00	(1.67)	14.21	(1.83)	0.44	(0.19)	
Poor Learners	4.17	(1.34)	14.06	(2.58)	0.48	(0.32)	